

Mikania micrantha

Mile-a-minute weed

The Asia-Pacific Forest Invasive Species Network (APFISN) has been established as a response to the immense costs and dangers posed by invasive species to the sustainable management of forests in the Asia-Pacific region. APFISN is a cooperative alliance of the 33 member countries in the Asia-Pacific Forestry Commission (APFC) - a statutory body of the Food and Agricultural Organization of the United Nations (FAO). The network focuses on inter-country cooperation that helps to detect, prevent, monitor, eradicate and/or control forest invasive species in the Asia-Pacific region. Specific objectives of the network are: 1) raise awareness of invasive species throughout the Asia-Pacific region; 2) define and develop organizational structures; 3) build capacity within member countries and 4) develop and share databases and information.



Seedling of Mikania



Branches with inflorescence

**Scientific name:***Mikania micrantha* H.B.K

Common name: American rope, Chinese creeper, mile-a-minute weed.

Local names: American vally, silk vally, kaipu vally, Dhritharashtra pacha (Kerala, India), cheroma, ulam tikus (Malaysia), sembung rambat (Indonesia).

Taxonomic position:

Division: Magnoliophyta

Class: Magnoliopsida

Order: Asterales

Family: Asteraceae

Distribution: Widespread in Asia and the Pacific, Australia and South, North and Central America.

Habit: It is a perennial twining herb with 5-ribbed branches, pubescent or glabrous; internodes are 7.5 - 21.5 cm long. Leaves are opposite, ovate-deltoid, 6 - 15 x 3 - 9 cm, base cordate, apex acuminate, margins are coarsely dentate, crenate or sub-entire, glabrous on both sides, minutely glandular beneath and 3 - 5 nerved from the base; the petiole is 3 - 7 cm long. The inflorescence is axillary paniced corymb; capitula is cylindrical, 1.5 mm across; there are 4 flowers per capitula; 4 involucre bracts, oblong to obovate, acute, green in colour, 1 - 3 mm long with a fifth smaller one that is 1 - 2 mm long; the corolla is 5-lobed, white, often with a purple tinge, 4 - 5 mm long; achenes 2 - 3 mm long, narrowly oblong, 4 - angled, black, glabrous; pappus capillary, uniseriate, connate at base, 3 mm long, white at first, becoming reddish-brown. In south-west India, flowering starts in August and continues up to January. Fruit setting occurs between September and February, initiated 17 - 21 days after flowering. A single stalk of mikania can produce 20,000 - 40,000 mature seeds in one season. Seeds are minute and bear pappus; dispersal of the seeds occurs between October and April. The mean number of seeds per mg is 108 ± 12 . The plants can grow vegetatively from the nodes and very small segments of the stem. Growth of young plants is extremely fast (8 - 9 cm in 24 h) and, using trees as support, the weed rapidly forms a dense cover over entangled leafy stems.



Mikania vine with mature seeds



Mikania seeds bearing pappus

This fact sheet is compiled and edited by Dr. K.V. Sankaran, APFISN Coordinator, Kerala Forest Research Institute, Peechi, Kerala, India (sankaran@kfri.org), on behalf of the Asia-Pacific Forest Invasive Species Network. For more information on APFISN and its activities, please contact your national focal point or the APFISN Coordinator or Mr. Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok. E-mail: patrick.durst@fao.org. The fact sheet is supported by the Food and Agriculture Organization of the United Nations (FAO) and USDA Forest Service.



Mikania growing along the banks of water bodies

Mode of infestation: Mikania can smother, penetrate crowns and choke and pull over plants. It thus causes a significant reduction in the growth and productivity of several crops. It successfully competes with trees and other crop plants for soil nutrients, water and sunlight. The weed can reduce light interception by covering the canopy of trees. Damage due to Mikania is high in young plantations compared to older ones since the weed can easily smother young trees. The adverse effect of Mikania on crops and soil properties is through the production of phenolic and flavanoid compounds.



Mikania penetrating the crown of coffee



Mikania overgrowing banana

Seed dispersal: Seeds are dispersed over long distances by wind, animals and water currents. The germination percentage of seeds is very low (8-12%) compared to other weedy species. Light, water, soil nutrients and fire affect the germination of seeds. The main mode of propagation is vegetative.

Habitat: Wet places, forest borders and clearings, along the banks of streams and rivers, roadsides and railway tracks, in pastures, forest plantations, agricultural and agro - forestry systems, open disturbed areas and barren lands. Mikania grows luxuriantly on leached and nutrient poor sandy loam to clayey soils. Being a C_3 plant, Mikania can produce a large quantity of biomass in a single life span. It shows a positive response to high potassium levels in soils and conserves potassium in slash and burn agriculture systems. Heavy grazing and browsing promotes the spread of Mikania into new ecosystems. The weed cannot tolerate shade and hence fails to penetrate undisturbed natural forest areas.



Mikania smothering vegetation in a degraded natural forest in India

Threat and damage: Mikania reduces growth and productivity of several crops such as oil palm, rubber, citrus, cassava, teak, eucalypt, acacia, albizia, pineapple, coconut and plantain in its introduced regions. The annual cost of controlling Mikania in rubber, oil palm and cocoa plantations in Malaysia is estimated to be around 8 - 10 million dollars. Besides the effect on crop yield, Mikania also makes harvesting difficult because of its creeping and twining habit. It was estimated that Mikania reduces 20% of the oil palm yield in Malaysia during the initial five years of production. Retardation of tree growth in Mikania-infested plantations is attributed to production of allelopathic substances by the weed. Infestation by the weed in natural forests in northeastern India caused a reduction in species richness, habitat destruction, species monopolization and new microsite formation. The weed renders collection of non-wood products (e.g., reed extraction) from natural forests less profitable, since heavy overgrowth of the weed disrupts collection.

Uses: Economic gains due to Mikania are meager compared to the loss due to its infestation in various ecosystems. It is used as a fodder in many countries. Sheep preferentially grazed Mikania in Malaysia and other cattle also relish it. In Kerala, India, the weed is utilized as a fodder in some parts of the state, especially during summer when availability of grass is scarce. However, Mikania is known to cause hepatotoxicity and liver damage in dairy cattle. The antibacterial effect of Mikania and its efficacy in wound healing has been reported. In Assam (NE India), Kabi tribes use the leaf juice of Mikania as an antidote for insect bite and scorpion sting. The leaves are also used for treating stomachache. Use of juice of Mikania as a curative agent for itches is reported from Malaysia. However, in all such cases therapeutic evidences are scarce or lacking. In Africa, Mikania leaves are used as a vegetable for making soups. The weed is used as a cover crop in rubber plantations in Malaysia. It is also planted on slopes to prevent soil erosion. Mikania green

manure has been reported to increase the yield of rice in Mizoram, India. Recent studies have shown that Mikania is not suitable for mulching and composting due to its high water content.

Control:

Mechanical: Sickle weeding, uprooting and digging are the main mechanical control methods in practice. Sickle weeding before flowering and seed setting gives temporary control. But quick re-growth from cut stumps frustrates this method. Uprooting during the initial stages of growth (before flowering and fruiting) is the most effective mechanical control method. The slash and burn technique is also practiced widely. However, the weed stock may survive burning and produce young shoots in a couple of months. Mechanical control method is very labour intensive and uneconomical. One advantage of this method is that it reduces the vegetative propagation of Mikania. In Indonesia, the cost of mechanical control of Mikania is estimated to be 125-175% higher than that of herbicidal control.



Leaf and petiole infection on Mikania caused by *Puccinia spegazzinii*



Herbicidal application on Mikania

Chemical: Both pre-emergent and post-emergent herbicides are generally used for Mikania control. Pre-emergence application of Oxyflourfen (0.06 kg ha^{-1}) + Paraquat (0.24 kg ha^{-1}) is reported to be effective if applied before flowering or seed setting. Glyphosate is widely used in many countries against mikania, especially in forest plantations. The dosage used varies widely (0.5 to 4.5 kg ha^{-1} or 0.75 to 8 l ha^{-1}) depending on the intensity of infestation and number of applications required for effective control. In general, the application of Glyphosate @ $2.5 - 5 \text{ l ha}^{-1}$ may take care of even heavy infestations. This herbicide can also inhibit germination of seeds of the weed. Application of Diuron at the rate of $1-2 \text{ kg ha}^{-1}$ is also reported to be equally effective as Glyphosate. Herbicides Triclopyr + Picloram (commercial name Grazon DS) @ 1.75 l ha^{-1} and Triclopyr (commercial name Garlon 600) @ 500 ml ha^{-1} also gives excellent control of Mikania.

All herbicidal applications should preferably be carried out before flowering and seed setting. It should also be borne in mind that though a single and thorough application of any one of these herbicides may control the weed for about an year, re-growth will occur in most areas through wind-borne seeds, especially after the onset of the monsoon. It may therefore be necessary to repeat annual applications for the next few years, depending on the severity of re-infestation.



Sickle weeding of Mikania

Biological: Biological control using a natural insect enemy, viz., *Liothrips mikaniae* from Trinidad, was attempted in the Solomon Islands and Malaysia but successful establishment was not achieved. Recent studies carried out by CABI Bioscience (UK) in collaboration with Kerala Forest Research Institute (India) and institutions under the Indian Council of Agricultural Research have shown that a highly damaging microcyclic rust, viz., *Puccinia spegazzinii*, which naturally occurs and causes damage to Mikania in the neotropics, has great potential as a biocontrol agent against the weed. The fungus was tested for host specificity against closely related members of Asteraceae and a number of economically important plants and



Close-up of leaf and petiole infection by *Puccinia spegazzinii*

proved highly specific to Mikania. It was released recently in tea plantations in northeast India and agricultural systems in southwest India and preliminary results on spread of the pathogen in the field has been encouraging.



Puccinia spegazzinii- infection at released sites, Kerala, India